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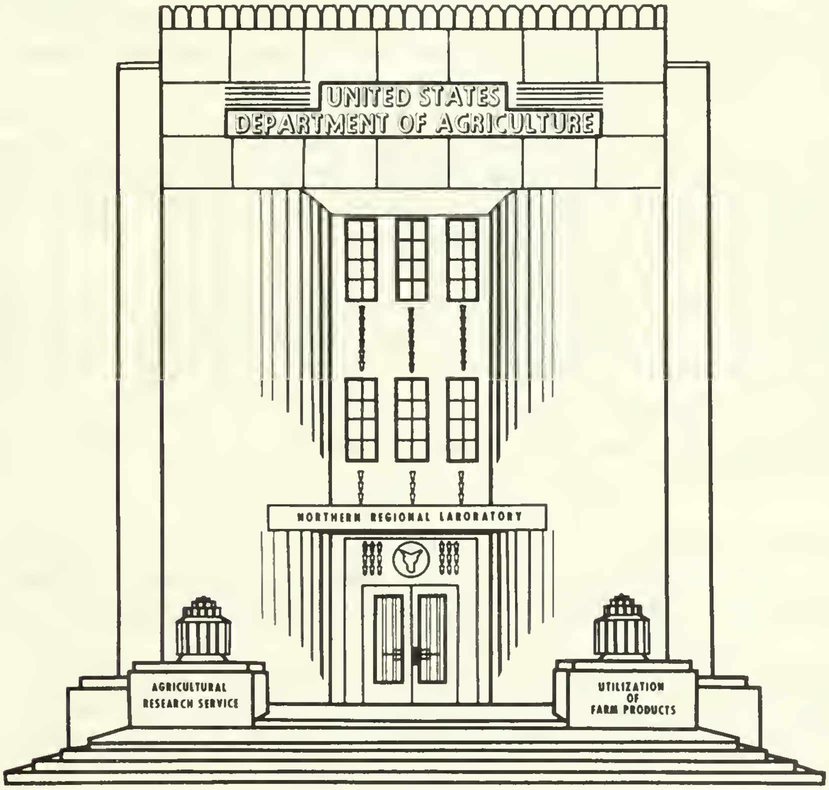
PUBLICATIONS AND PATENTS

of the

NORTHERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION
Peoria, Illinois, for the period
JULY - DECEMBER 1960


UNITED STATES
DEPARTMENT OF AGRICULTURE
NORTHERN REGIONAL LABORATORY
AGRICULTURAL RESEARCH SERVICE
UTILIZATION OF FARM PRODUCTS

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Congress in 1938 authorized four regional laboratories to conduct basic and applied research designed to expand, improve and develop through science and technology the utilization of American farm crops. Agricultural products assigned the Northern Division are: *The cereal grains*--corn, wheat, barley, grain sorghum, and oats; *the oilseeds*--soybean, flaxseed, safflower, and erucic acid-containing oilseeds; and *new crops*. The abstracts in this list describe current research on these commodities and indicate progress achieved by the Northern Division

Northern Division publications are available, in conformance with the policy of the Department of Agriculture, to scientists and other specialists, librarians, representatives of the press, and others interested. Titles of publications no longer available are marked with an asterisk (*).

Requests for specific reprints should be addressed to: Northern Utilization Research and Development Division, 1815 North University, Peoria, Illinois. Mailing lists are not maintained except for the list of Publications and Patents.

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Printed copies of patents, which are assigned to the Secretary of Agriculture, can be obtained only by purchase (25 cents each) from the Commissioner of Patents, U. S. Patent Office, Washington 25, D. C. Order by number, do not send stamps.

Previous lists of publications and patents were issued as NM-305, AIC-187, and AIC-318, with supplements. Copies of these lists are available on request.

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PUBLICATIONS

[Publications marked (*) are not available for distribution]

ANTIBIOTICS AGAINST PLANT DISEASE. VII. THE ANTIFUNGAL HEPTAENE COMPONENT (F-17-C) PRODUCED BY *STREPTOMYCES CINNAMOMEUS* F. *AZACOLUTA*.

R. Craveri, O. L. Shotwell, R. G. Dworschack, T. G. Pridham, and R. W. Jackson.
Antibiotics & Chemotherapy 10(7): 430-439. July 1960.

Antibiotic F-17-C is very labile to heat and light. It has an ultraviolet absorption in ethanol typical of heptaenes with peaks at 408, 383, and 365 mµ. In water, it has a spectrum with maxima at 250 and 390 mµ at neutrality which reverts under alkaline conditions to the spectrum exhibited in ethanol.

Paper chromatograms in five solvent systems of nine known heptaene antibiotics clearly differentiated F-17-C from candidin and amphotericin B. The other heptaenes studied were ascosin, candicidin, candimycin, trichomycin, PA-150, 1968 and 757. When methanol:water:ammonium hydroxide (20:4:1) was used as a developing solvent, the antibiotics (excluding candidin and amphotericin B) were separated into several factors. Although these same factors were common to many of the heptaenes, no previously reported heptaene antibiotic studied had the same combination of factors as F-17-C.

DETERMINATION OF THE EXTENT OF REACTION BETWEEN EPICHLOROHYDRIN AND STARCH.

G. E. Hamerstrand, B. T. Hofreiter, and C. L. Mehltretter.
Cereal Chem. 37(4): 519-524. July 1960.

Crosslinking of starch in the granular form through heterogeneous reaction with extremely small quantities of epichlorohydrin, in an alkaline medium with a high salt concentration, is well known. To determine the rate and extent of this reaction, epichlorohydrin in reaction filtrates was converted to glycerol by hot alkali. Periodate oxidation of the glycerol solutions yielded formaldehyde, which was estimated colorimetrically using the chromotropic acid color reaction.

Under the reaction conditions described a maximum extent of reaction of 90% was obtained. A blank correction was required to account for alkali-solubilized material from starch, which under the conditions of analysis yielded an apparent value for epichlorohydrin. It was required, for valid application of these analyses, that the epichlorohydrin-starch reaction be conducted in a gas-tight system. The quantities of epichlorohydrin reacted, as indicated by the analyses, are not necessarily exclusively involved in crosslinking. With molar ratios of anhydroglucose units to epichlorohydrin as low as 1,200 to 1, marked inhibition of the granule to swelling in hot water resulted.

DIFFERENTIATION OF HYDROGEN BROMIDE-REACTIVE ACIDS IN SEED OILS.

C. R. Smith, Jr., M. C. Burnett, T. L. Wilson, R. L. Lohmar, and I. A. Wolff.
J. Am. Oil Chemists' Soc. 37(7): 320-323. July 1960.

A method is presented for differentiating between epoxy acids and others without epoxides but which react similarly in the Durbetaki titration of seed oils. Application to selected oils is discussed. The basis of the procedure is titration with hydrogen bromide before and after reduction with lithium aluminum hydride. The reduction reaction produces a crystalline derivative suitable for verifying the presence and identity of dimorphecolic acid, one nonepoxide-containing substance which absorbs hydrogen bromide under conditions of the Durbetaki epoxide procedure.

HIGH WET-STRENGTH PAPER BY WET-END ADDITION OF DIALDEHYDE STARCH.

B. T. Hofreiter, G. E. Hamerstrand, C. L. Mehltretter, W. E. Schulze, and
A. J. Ernst.
TAPPI 43(7): 639-643. July 1960.

Dialdehyde starch, a polymeric dialdehyde produced by periodic acid oxidation of corn starch, gives wet strength to paper when applied as a tub size and can be added at one wet end. Excellent wet strength and improved dry strength result from 0.5 to 10% application based on the dry pulp. The manner of dispersing dialdehyde starch, using alum, and pH were found to be determinate factors in the retention of dialdehyde starch by the cellulosic fibers. Advantages of wet-end addition of dialdehyde starch in papermaking are: Rapid development of wet strength without heat, no extended cure required for either the stable dialdehyde dispersions or the newly formed sheets, ease of broke recovery, and commercial availability of this unique product.

LACK OF CORRELATION BETWEEN THE AMYLOSE CONTENT OF POLLEN AND ENDOSPERM IN MAIZE.

M. S. Zuber,[1] W. L. Deatherage, M. M. MacMasters, and V. L. Fergason.[1]
[1] (USDA Crops Research Division, Missouri Agricultural Experiment Station, Columbia, Mo.)
Agron. J. 52(7): 411-412. July 1960.

Studies showed no apparent relationship between the percentage of amylose in endosperm starch and that found in pollen starch of the same corn inbred line. Protein content of pollen was not correlated with amylose content of the pollen starch. There was no correlation between protein content of the endosperm and of the pollen.

A NOTE ON THE ENZYMATIC REDUCTION OF PROTEIN IN HIGH-AMYLOSE CORN STARCH.

Charles Vojnovich, R. A. Anderson, and E. L. Griffin, Jr.
Cereal Chem. 37(4): 576-578. July 1960.

The enzymes, papain and trypsin, reduce the protein content of corn starch containing 57% amylose from 0.81-1.27% to 0.42-0.57%, depending on the enzyme and conditions used. Trypsin appears more active than papain under all the conditions investigated. In the experiments, the final protein content of the trypsin-treated starch was about the same, even though the protein content of the starting material varied from 0.81 to 1.27%. Optimum conditions established for this treatment are: pH range 6.1-8.8; enzyme concentration, 0.2%; temperature, 40° C.; and time, 2 hours.

TOFU FROM JAPANESE AND UNITED STATES SOYBEANS.

Allan K. Smith, Tokuji Watanabe, and Arlo M. Nash.
Food Technol. 14(7): 332-336. July 1960.

Tofu or bean curd was made from 15 United States and 5 Japanese varieties of soybeans and compared for yield, texture, color, and other qualities. The tofu from Lee and Jackson varieties was as good as that from Japanese beans. Tofu from five other U. S. varieties appeared promising. Yields of tofu vary with variety (location), but the average yield from U. S. and Japanese soybeans was about the same.

TOWARD NEW CHEMURGIC CROPS.

I. A. Wolff and Quentin Jones.[1] [1](USDA Crops Research Division, Beltsville, Md.)
Chemurgic Dig. 19(7): 4-9. July 1960.

In a cooperative program to seek new crops as alternatives for those in surplus, constituents valuable as industrial raw materials are being sought chemically in less well-known plants. Any new domestic crop must also be profitable for the American farmer to grow, permit diversification, satisfy future consumer demands, supply critical raw materials, or replace nonrenewable resources.

Research progress is reported on finding seed oil components, proteins, fibrous cellulose, and seed mucilages that have unusual properties of chemical structure and that may have a competitive advantage over materials nonagricultural in origin.

VITAL WHEAT GLUTEN BY DRUM DRYING. II. PILOT-PLANT STUDIES AND COST ESTIMATES.

Charles Vojnovich, V. F. Pfeifer, R. A. Anderson, and E. L. Griffin, Jr.
Cereal Chem. 37(4): 422-435. July 1960.

Conditions and equipment suitable for the production of dry vital wheat gluten by drum-drying wet gluten dispersed in dilute acetic acid were studied. In these tests a satisfactory product was obtained by completely dispersing wet gluten in dilute acetic acid at a pH from 4.3 to 5.1 and a solids concentration of 12-20% by weight, by drum-drying the dispersed gluten at atmospheric pressure and a temperature about 260° F. (127° C.), and by grinding the dried material in an attrition or hammer mill. The process uses standard equipment, and it can be readily adapted in industrial plants to make dry vital gluten for baking or other food purposes, or for the preparation of industrial chemicals. Cost estimates for drying 6 million pounds of vital gluten product annually by this process show a total drying cost of 4 cents per pound of dry material in a plant costing about $477,000.

FRACTIONATING CORN, SORGHUM AND SOY FLOURS BY FINE GRINDING AND AIR CLASSIFICATION.

V. F. Pfeifer, A. C. Stringfellow, and E. L. Griffin, Jr.
Am. Miller *& Processor* 88(8): 11-13, 24. August 1960.

Flours from corn, sorghum, and defatted soybeans were fractionated by air classification, both as-milled and after regrinding in a pin mill, to determine the variety of materials of differing chemical compositions and physical properties obtainable from each. Yields as well as some chemical and physical characteristics of the various fractions, such as protein, fat, ash, maltose value, and particle size, were determined. Corn flour yielded fractions varying in protein content from 4.9 to 10.7%; fractions from sorghum flour varied in protein content from 6.0 to 27.7%; fractions from soybean flour varied in protein content from 51.2 to 59.9%.

Fractionation of soy flour was relatively ineffective for producing materials with a range of chemical compositions. Separating corn and sorghum flours appears practical, but the degree of separation compares unfavorably with that possible with most wheat flours. The low-fat product produced in large yield by air classification of reground corn flour should have an enhanced value for industrial uses which cannot tolerate more than about 0.9% fat.

LABELING FATTY ACIDS BY EXPOSURE TO TRITIUM GAS. II. METHYL OLEATE AND LINOLEATE.

E. P. Jones, L. H. Mason, H. J. Dutton, and R. F. Nystrom.[1] [1](Radiocarbon Laboratory, University of Illinois, Urbana, Ill.)
J. Org. Chem. 25(8): 1413-1417. August 1960.

Unsaturated fatty acid esters react at room temperature on exposure to gaseous tritium by addition of tritium to a double bond and with little or no substitution of tritium for hydrogen. Evidence for addition to olefinic bonds, rather than substitution for hydrogen, has been obtained from gas-liquid and liquid-partition chromatography of both the tritiated fatty acids and the tritiated products after mild oxidative cleavage. Tritiated fatty acid esters appear on chromatograms at positions of the next less-saturated member of the isologous series. The position of addition of the tritium is deduced from the radioactivity of the monobasic and dibasic acids produced by oxidation.

LABORATORY PRODUCTION OF A PHOSPHORYLATED MANNAN BY *HANSENULA HOLSTII*.

Ralph F. Anderson, Martin C. Cadmus, R. G. Benedict, and M. E. Slodki.
Arch. Biochem. Biophys. 89(2): 289-292. August 1960.

Conditions for the production of a phosphorylated mannan by strains of the yeast *Hansenula holstii* were investigated. Polysaccharide was produced from glucose in media containing organic nitrogen and inorganic salts. The ratio of mannose to phosphate in the polymer was not altered by changes in medium constituents. Yields of polymer in the range of 50-55% based on glucose were realized in shaken-flask experiments.

REACTIONS OF UNSATURATED FATTY ALCOHOLS. XII. POLYMERS FROM POLYUNSATURATED FATTY VINYL ETHERS AND CERTAIN CROSS-LINKING MONOMERS.

L. E. Gast, R. J. Stenberg, Wilma J. Schneider, H. M. Teeter, H. O. Schoen,[1] B. G. Brand,[1] and E. R. Mueller.[1] [1](Battelle Memorial Institute, Columbus, Ohio).
Offic. Dig., Federation Soc. Paint Technol. 32(427): 1091-1101. August 1960.

Fatty vinyl ethers were copolymerized with varying amounts of vinyl ethers containing reactive groups capable of crosslinking during polymerization or subsequent film formation. Also prepared were terpolymers containing as a third component a lower saturated alkyl vinyl ether.

The properties of films of these polymers were studied in relation to such variables as type and amount of driers and baking cycle. Optimum properties for films on steel were usually achieved with 0.01% cobalt and 0.5% lead driers (as naphthenates) and a baking cycle of 15 min. at 450° F. Films from copolymers and terpolymers prepared with cross-linking monomers were generally harder and had increased alkali resistance as compared to films from polymers not containing these monomers.

EFFECT OF AUTOXIDATION PRIOR TO DEODORIZATION ON OXIDATIVE AND FLAVOR STABILITY OF SOYBEAN OIL.

C. D. Evans, E. N. Frankel, Patricia M. Cooney, and Helen A. Moser.
J. Am. Oil Chemists' Soc. 37(9): 452-456. September 1960.

The initial flavor and stability of soybean oil were adversely affected with increasing levels of autoxidation prior to deodorization. Nonvolatile products are formed from hydroperoxides during deodorization of the oil; they have reducing properties and give a positive test for carbonyl groups.

Similarly, the destruction of the hydroperoxides of unsaturated fatty acid esters at deodorization temperatures produced fat-soluble materials that possessed reducing properties and carbonyl functions. Their addition to soybean oil resulted in a reduction of oxidative and flavor stability similar to that due to autoxidation of the oil prior to deodorization. The work indicates the need to minimize autoxidation in soybean oil prior to deodorization to ensure good flavor stability.

PARTICLE SIZE IN AQUEOUS STARCH DISPERSIONS.

G. E. Babcock, R. Tobin, R. J. Dimler, and F. R. Senti.
Cereal Chem. 37(5): 645-655. September 1960.

Particle size in starch dispersions prepared by commonly used methods or by high-shear treatments were examined by ultracentrifugal and light-scattering methods. Heating at 98° or 120° C. in water left nearly 70% of the corn starch as relatively large, incompletely dispersed granule fragments which had sedimentation coefficients S_{20} greater than 1,500S (Svedberg units). About one-half the dispersed starch was free amylose, which sedimented as a separate component with S_{20} = 5-6S. Remaining dispersed particles had sedimentation coefficients up to 600S.

Most marked effect of sodium hydroxide (1.0N) on autoclaved solutions was to free all the amylose component with little change in the degree of dispersion of the amylopectin residue. Ammonia pregelatinization weakened the granule structure of corn starch and doubled the extent to which it was dispersed in water at 98°. High rate of mechanical shear was effective in dispersing granule fragments in starch pastes. Average particle size could be reduced readily to a narrow distribution with S_{20} = 80-150S and particle weights of 80-150 million. Little difference was found in the extent of dispersion of corn and wheat starch pastes under shear. Amount of free amylose in solution was relatively unaffected by reduction in particle size and comprised about 60 to 75% of the total amylose content of the starch.

PREPARATION AND PROPERTIES OF HYDROXYETHYLATED HIGH-AMYLOSE CORN STARCH.

J. C. Rankin, J. G. Rall, C. R. Russell, and F. R. Senti.
Cereal Chem. 37(5): 656-670. September 1960.

Corn starch with an amylose content of 50% was hydroxyethylated in the dry state with ethylene oxide and an alkali catalyst to give products containing from 1 to 27% by weight of combined ethylene oxide in quantitative yields. Aqueous slurries of hydroxyethylated high-amylose starch (etherified to an extent of 5% or more) when cooked to temperatures between 73 and 90° C. gave pastes which were fluid in character and had improved dispersion stability on cooling and aging over that of the unmodified starch. In the cooking-cooling cycle the viscosity curves exhibited by these products are considerably lower than that of similarly substituted waxy and normal corn starches. Pastes of modified 50%-amylose starch are less translucent than those of like derivatives of the other two starches.

Pasting characteristics of hydroxyethylated high-amylose starch are correlated with such variables of preparation as degree of substitution, alkali catalyst concentration, and pH of product. Microscopic examination and film-forming properties of their pastes are discussed.

Improved pasting properties obtained by hydroxyethylation of high-amylose starch indicate promise for this derivative of the new starch in industrial applications.

SEARCH FOR NEW INDUSTRIAL OILS. IV.

F. R. Earle, C. A. Glass, Glenda C. Geisinger, I. A. Wolff, and Quentin Jones.[1]
[1](USDA Crops Research Division, Beltsville, Md.)
J. Am. Oil Chemists' Soc. 37(9): 440-447. September 1960.

Seed oils from 158 species in 52 plant families were analyzed for selected chemical and physical characteristics. For only 24 of these oils are compositional data found in readily available literature and reference works. The diversity of the oils is indicated to some extent by the range found in iodine value, 6 to 214, and in saponification value, 95 to 284. Two new oils rich in capric acid were found. Nine oils contained at least 70% of apparent linoleic acid and 5 contained 55% or more apparent linolenic acid. Conjugated triene was found in two new sources to the extent of 34 and 21%; the latter source also contained 12% conjugated diene. Nineteen other oils contained conjugated diene, ranging from 1 to 8%, usually accompanied by sufficient HBr absorption and hydroxyl content to suggest the presence of dimorphecolic acid. Seventeen oils, including 11 of those with conjugated diene, absorbed HBr equivalent to 5% or more C_{18} epoxy acid. Fifteen of the 48 oils analyzed for hydroxyl contained 5% or more apparent C_{18} hydroxy acid. Twenty-nine oils gave positive qualitative tests for carbonyl, but only 5 contained carbonyl equivalent to 5% or more C_{18} keto acid. One new oil containing acetylenic bonds was detected by infrared. The usual alkali isomerization procedure for polyunsaturated acids gave obviously anomalous results for 23 oils.

THERMAL DIMERIZATION OF FATTY ESTER HYDROPEROXIDES.

E. N. Frankel, C. D. Evans, and J. C. Cowan.
J. Am. Oil Chemists' Soc. 37(9): 418-424. September 1960.

When autoxidized fatty esters and purified fatty hydroperoxides are decomposed by heating in the absence of oxygen at 210° C., the principal reaction that occurs is the dimerization of the fatty acid chains with elimination of the hydroperoxide groups. Similar conditions are encountered during deodorization of vegetable oils in commercial processing. The dimers formed may contribute to the flavor reversion problem.

Dimers isolated by molecular distillation have approximately 1 mole hydroxyl, 0.5 mole of carbonyl, and 1 or 2 double bonds per mole of dimer. The dimer is not split either by catalytic hydrogenation or by hydrogen iodide, indicating a carbon-carbon bond between the monomer units. Evidence also indicates that the dimer does not have a 6-membered ring. Dimerization of the hydroperoxides is indicated as occurring through an alkyl-free radical to give carbon-carbon linked fatty acid dimers and some higher polymer units.

FORMATION OF EXTRACELLULAR SPHINGOLIPIDS BY MICROORGANISMS. II. STRUCTURAL STUDIES ON TETRAACETYLPHYTOSPHINGOSINE FROM THE YEAST *HANSENULA CIFERRII*.

Frank H. Stodola and Lynferd J. Wickerham.
J. Biol. Chem. 235(9): 2584-2585. September 1960.

An extracellular crystalline product formed by the yeast *Hansenula ciferrii* has been shown to consist largely of tetraacetylphytosphingosine. Identity was established by comparison of acetone, N-benzoyl, and N-benzoyltriacetyl derivatives of the free base with corresponding derivatives prepared from phytosphingosine obtained from corn phosphatide.

FORMATION OF EXTRACELLULAR SPHINGOLIPIDES BY MICROORGANISM. I. TETRAACETYLPHYTOSPHINGOSINE FROM *HANSENULA CIFFERRII*.

Lynferd J. Wickerham and Frank H. Stodola.
J. Bacteriol. 80(4): 484-491. October 1960.

Two new crystalline substances have been obtained from the yeast *Hansenula ciferrii*. One is tetraacetylphytosphingosine, a compound not previously reported from natural sources. It is produced extracellularly when mating type 11 of *H. ciferrii* Y-1031 is grown on a solid medium. This product was formed by a much higher percentage of mating types of one sex (a) than of the other sex (b). Oxidative mating types, which are characterized by mat growth on slants, produced more of the material than the fermentative, glistening types. The parent bisexual stock culture NRRL Y-1031 produced very little.

CHEMICAL COMPOSITION OF KERNEL FRACTIONS OF CORN SAMPLES VARYING IN AMYLOSE CONTENT.

M. S. Zuber,[1] W. L. Deatherage, C. O. Grogan,[1] and M. M. MacMasters.
[1](USDA Crops Research Division, Missouri Agricultural Experiment Station, Columbia, Mo.)
Agron. J. 52(10): 572-575. October 1960.

In a series of corn samples with starch at six different amylose ranges (21-30, 31-40, up to 80%), as amylose content increased: weight of endosperm decreased, weight of pericarp and of germ increased, endosperm protein and total oil increased, and starch decreased. The same sources of *se* and *du* genes were used in making all of the corns studied; *quite different results might be found* for corn prepared with these genes from other sources or with different modifiers.

FRACTIONATION OF OMAR-BREVOR WHEAT FROM THE PACIFIC NORTHWEST.

V. F. Pfeifer, A. C. Stringfellow, and E. L. Griffin, Jr.
Northwest. Miller 264(8): 46-48. October 17, 1960.

Straight grade commercial soft white winter wheat flour milled especially for pastry use from Omar wheat predominantly, but containing some Brevor wheat, was fractionated by air classification, both as-milled and after regrinding in a pin mill. Yields and some chemical and physical characteristics of the various fractions, such as protein, fat, ash, maltose value, and particle size were determined.

HETEROTHALLISM IN *SACCHAROMYCES ROUXII*.

Lynferd J. Wickerham and Kermit A. Burton, with the technical assistance of Jane A. Roberson.
J. Bacteriol. 80(4): 492-495. October 1960.

Mating types of *Saccharomyces rouxii* were obtained from two samples of miso. Both samples yielded smooth, glistening colonies and mat, often rugose, colonies. The glistening type mated well with opposite sexes of the same type, and poorly with opposite sexes of the mat type. Opposite sexes of the mat type mate very poorly or not at all. The mat types apparently have a greater tendency to produce diploid cells than do the glistening types. The diploid cells so produced form aborted asci.

PASTING BEHAVIOR OF DICARBOXYL STARCHES PREPARED FROM CROSS-LINKED CORN STARCH.

B. T. Hofreiter, James Bennie, G. E. Hamerstrand, and C. L. Mehltretter.
J. Chem. Eng. Data 5(4): 480-483. October 1960.

A series of slightly modified starches having varied degrees of crosslinking and carboxylation was investigated under a wide variety of pasting conditions. The characteristics reported should prove useful for many applications.

PRODUCTION OF KOJIC ACID WITH *ASPERGILLUS FLAVUS*.

R. A. Rhodes and R. W. Jackson.
U. S. Dept. Agr. ARS-71-16, October 1960. 17 pp. [Processed].

The work on the production of kojic acid with *Aspergillus flavus* was conducted by Dr. Andrew J. Moyer, who died February 17, 1959. This material was put into final form by Drs. Rhodes and Jackson. The bulletin describes improved procedures developed for the production of kojic acid by surface cultures of *Aspergillus flavus* NRRL 484; methods for the production of spore inocula and studies on the nutritional factors which affect kojic acid formation as presented.

UNIQUE FATTY ACIDS FROM *LIMNANTHES DOUGLASII* SEED OIL: THE C_{20}- AND C_{22}-MONOENES.

C. R. Smith, Jr., M. O. Bagby, T. K. Miwa, R. L. Lohmar, and I. A. Wolff.
J. Org. Chem. 25(10): 1770-1774. October 1960.

The principal fatty acids of *Limnanthes douglasii* seed oil are shown to include two previously unknown: *cis*-5-eicosenoic (65%) and *cis*-5-docosenoic acid (7%). The oil also contains *cis*-13-docosenoic (erucic) acid (13%) and 10% of an unknown C_{22}-acid.

CONTINUOUS PULPING OF WHEAT STRAW FOR CORRUGATING MEDIA.

T. F. Clark, J. E. Atchison,[1] A. J. Ernst, E. R. Gremler,[2] and I. A. Wolff.
[1](Parsons and Whittemore, Inc., New York, N. Y.) [2](Pandia Division, Black-Clawson Co., Hamilton, Ohio).
TAPPI 43(11): 934-938. November 1960.

Rapid continuous pulping of wheat straw was investigated as a technique for the manufacture of corrugating board. Variables included chemical concentration, dwell time, steam pressure (temperature), and the pulping chemicals caustic soda, caustic soda-sodium sulfite, and caustic soda-sodium sulphide. For semicommercial-scale pulping 6% caustic soda, based on straw, 75 p.s.i. steam (160° C.), and 8 minutes dwell time were used. The refined straw pulp was used alone and in a blend with boxshop clippings to make 9-point boards on a fourdrinier machine. The boards were fluted, combined, and fabricated into shipping containers in a commercial plant.

Component materials and test boxes were evaluated with the cooperation of manufacturers of straw corrugating. The wheat straw pulp prepared under continuous conditions proved satisfactory for the production of corrugating medium.

HYDROGENATION OF LINOLENATE. I. FRACTIONATION AND CHARACTERIZATION STUDIES.

C. R. Scholfield, E. P. Jones, Janina Nowakowska, E. Selke, B. Sreenivasan, and H. J. Dutton.
J. Am. Oil Chemists' Soc. 37(11): 579-582. November 1960.

Methyl linolenate, hydrogenated at 140° C. with 0.5% Ni catalyst and 1.1 mole of hydrogen at atmospheric pressure, was separated into octadecenoate, octadecadienoate, and octadecatrienoate fractions by countercurrent distribution. Gas chromatography revealed one component in the triene fraction, four in the diene, and nine in the monoene. The components were partially fractionated by low temperature crystallization, and their solubilities were correlated with alkali conjugation results, with infrared data for *cis* and *trans* configuration of bonds, and with dibasic acids isolated from the fractions after oxidative cleavage. Approximately 45% of *trans* acids were present in both the monoene and diene fractions. Considerable migration of double bonds from the original 9, 12, and 15 positions occurred. *Cis,cis* dienes which could not be conjugated by alkali were formed. Little alteration of the residual methyl linolenate was observed.

NONCONJUGATED LINSEED VINYL ETHER BY VINYL TRANSETHERIFICATION. PREPARATION PROCEDURE.

O. L. Brekke and L. D. Kirk.
J. Am. Oil Chemists' Soc. 37(11): 568-570. November 1960.

An improved procedure is described for preparing nonconjugated linseed vinyl ether monomer by transetherification of linseed alcohol with ethyl vinyl ether. In 6½ hours, 91% of the linseed alcohol was converted to the fatty vinyl ether by use of a 0.006 molar concentration of a 1:1 mercuric acetate-oxalic acid catalyst mixture, a 45° C. reaction temperature, and an evaporation, water-extraction procedure for continuous removal of byproduct ethanol coupled with recycling of the washed ethyl vinyl ether (in excess) during the transetherification reaction. More catalyst was required when mercuric acetate alone was used; at 90° C. or above, the overall rate and yield were reduced. This reduction was attributed to partial deactivation of the catalyst resulting from a reaction between it and the olefinic bonds in the linseed alcohol. Purification was readily accomplished by vacuum distillation followed by an alumina adsorption treatment for the highest purity. The monomer, vacuum-distilled only, should be of suitable polymerization quality for many purposes.

PROGRESS IN SOYBEAN PROTEIN UTILIZATION.

Joseph J. Rackis and J. C. Cowan.
Soybean Dig. 21(1): 14-17. November 1960.

The technological advances responsible for the phenomenal increase in the use of soybean oil meal, flour, and isolated protein in foods, feeds, and industrial products are reviewed. A discussion of the need for research to improve and expand present uses of soybeans and an estimate of future production are included.

RAMULOSIN, A $C_{10}H_{14}O_3$ COMPOUND PRODUCED BY THE FUNGUS *PESTALOTIA RAMULOSA*.

Chester R. Benjamin and Frank H. Stodola.
Nature 188(4751): 662-663. November 19, 1960.

A crystalline $C_{10}H_{14}O_3$ compound (m.p. 121-122°) was isolated in good yield from still cultures of a nonsporulating strain of *Pestalotia ramulosa* v. Beyma, an imperfect fungus belonging to the order Melanconiales.

REACTION OF HYDROGEN BROMIDE WITH CONJUGATED DIENOLS.

R. L. Lohmar, C. R. Smith, Jr., and T. L. Wilson.
J. Org. Chem. 25(11): 2034-2035. November 1960.

Rapid consumption of hydrogen bromide by dimorphecolic acid appears to proceed by displacement of hydroxyl to form a bromodiene. The bromodiene is in equilibrium with the triene produced by dehydrobromination. Analogous behavior is exhibited by a model compound, 4,6-octadiene-3-ol.

REACTIONS OF POLYUNSATURATED FATTY ALCOHOLS. IX. MOLECULAR-WEIGHT DISTRIBUTION OF SOME CONJUGATED SOYBEAN VINYL ETHER HOMOPOLYMERS.

H. M. Teeter, L. C. Dorman, and L. Harris.
J. Am. Oil Chemists' Soc. 37(11): 552-555. November 1960.

Molecular weight distributions of several conjugated soybean vinyl ether homopolymers were studied by the integral fractionation technique and found to approximate the so-called "most probable" distributions expected theoretically for polymers obtained by sample difunctional polymerization. The type of distribution appeared to be independent of molecular weight or catalyst used in preparing the polymers.

REACTIONS OF UNSATURATED FATTY ALCOHOLS. X. PREPARATION OF SOME COPOLYMERS OF NONCONJUGATED LINSEED VINYL ETHER.

W. J. DeJarlais and H. M. Teeter.
J. Am. Oil Chemists' Soc. 37(11): 556-558. November 1960.

Vinyl ethers were prepared from benzyl, 2-phenylethyl, 3-phenylpropyl, 2-benzyloxyethyl, 2-(*p-tert.*-butylphenoxy) ethyl, tetrahydrofurfuryl, and 2-cyanoethyl alcohols. These vinyl ethers, as well as 1-methoxy-1,3-butadiene and cyclohexyl vinyl ether, were copolymerized with nonconjugated linseed vinyl ether. The copolymers were baked to give films having moderate hardness and fair resistance to alkali and acid.

VOLATILE ALCOHOLS IN DILUTE AQUEOUS SOLUTIONS BY ALKOXYL METHOD.

Clara McGrew and C. H. VanEtten.
J. Assoc. Offic. Agr. Chemists 43(4): 772-773. November 1960.

The need for a method to estimate small amounts of alcohols in aqueous starch solutions led to a study of the microalkoxyl method for this purpose. Dilution of the hydriodic acid reagent with water gave incomplete recovery of the alcohol as its volatile iodide. By correcting for this loss under standardized conditions the method successfully determined the amount of alcohol in aqueous starch solutions. Data are presented to show that the method can be used for measuring methyl, ethyl, isopropyl, allyl, and *n*-butyl alcohols present in aqueous solutions in concentrations from 0.01 to 1.0 weight per volume percent. Based on 94 determinations of the alcohols, the average recovery was 100.7% with a standard deviation of 5.59.

CHROMATOGRAPHIC FRACTIONATION OF WHEAT GLUTEN ON CARBOXYMETHYLCELLULOSE COLUMNS.

J. H. Woychik, R. J. Dimler, and F. R. Senti.
Arch. Biochem. Biophys. 91(2): 235-239. December 1960.

A chromatographic procedure has been developed to isolate purified wheat gluten components in preparative amounts through the use of carboxymethylcellulose columns. These isolated proteins correspond to electrophoretic components demonstrated in wheat gluten protein.

CLINICAL-SIZE DEXTRAN BY DIRECT FERMENTATION (WITH NRRL B-1351 *STREPTOCOCCUS SP.*).

S. P. Rogovin, F. R. Senti, R. G. Benedict, H. M. Tsuchiya, P. R. Watson, R. Tobin, V. E. Sohns, and M. E. Slodki.
J. Biochem. Microbiol. Technol. Eng. 2(4): 381-399. December 1960.

Dextran, a polymer of glucose, has been widely used as a blood-plasma volume expander. In whole culture fermentations most dextran-producing organisms elaborate dextrans that have molecular weights of many millions and must be depolymerized and fractionated to obtain a product suitable for clinical use. An exception is *Streptococcus sp.* (Strain DS-50) NRRL B-1351, originally reported by E. J. Hehre (*J. Biol. Chem.*, 222, 739-50 (1956)).

A process for the production in high yields of clinical-size dextran with NRRL B-1351 has been developed. A decrease in inoculum size from 10% down to 0.2% shortened the fermentation time and increased the yields of dextran. Fermentations conducted in media containing 15% sucrose, initial pH of 7.4, temperature of 97° F., without aeration or agitation were complete in less than 48 hours. Yields of native dextran and clinical-size dextran by methanol precipitation were 68 and 48% of theory, respectively.

CUPHEA LLAVEA SEED OIL, A GOOD SOURCE OF CAPRIC ACID.

T. L. Wilson, T. K. Miwa, and C. R. Smith, Jr.
J. Am. Oil Chemists' Soc. 37(12): 675-676. December 1960.

Fatty acids in the seed oil of *Cuphea llavea* var. *miniata* are reported to be 83% capric acid. This herbaceous perennial of the Lythraceae family is commonly known as cinnabar cuphea. Since the dry seed contains 16% capric acid, this species is a potential economic source of the acid; consequently, confirmation of the gas chromatographic analysis was sought. Chemical characterization has now established that the major acid is capric. At least 72% of the capric acid present may be isolated in 97% purity by steam distillation of the mixed fatty acids.

DISULFIDE BONDING OF ANTIGEN SUBUNITS IN THE PHOTOCHEMICAL APPARATUS OF BACTERIA.

J. W. Newton.
J. Am. Chem. Soc. 82(23): 6205-6206. December 5, 1960.

Separation of antigen groups in the photochemical apparatus of the bacterium *Rhodospirillum rubrum* was accomplished by treatment with reagents which cleave disulfide bonds under mild conditions. This treatment, which resulted in formation of univalent fragments of the complex antigen, opened up the photochemical unit and has made possible a study of its repeating substructure.

GAS CHROMATOGRAPHIC CHARACTERIZATION OF FATTY ACIDS. IDENTIFICATION CONSTANTS FOR MONO- AND DICARBOXYLIC METHYL ESTERS.
Thomas K. Miwa, Kenneth L. Mikolajczak, Fontaine R. Earle, and Ivan A. Wolff.
Anal. Chem. 32(13): 1739-1742. December 1960.

Readily reproducible numerical constants were determined for characterizing mono- and dicarboxylic methyl esters by gas-liquid chromatography. For a specified column packing and carrier gas, these constants, called equivalent chain lengths, are independent of experimental conditions. A combination of two values, obtained by use of polar and nonpolar packing, is sufficient to characterize most fatty acids.

POLYESTERS FROM 3,9-BIS(7-CARBOMETHOXYHEPTYL)-2,4,8,10-TETRAOXASPIRO-[5.5]UNDECANE. A NEW METHOD OF CROSS LINKING POLYESTERS.
E. H. Pryde, R. A. Awl, H. M. Teeter, and J. C. Cowan.
J. Org. Chem. 25(12): 2260. December 1960.

A new dibasic ester (I) has been readily prepared in good yield from the reaction of pentaerythritol with methyl azelaaldehydate, a product from the ozonolysis of methyl oleate. When condensed with ethylene glycol in the presence of calcium oxide, I gave a soluble poly(ester-acetal), melting 78-81° and having a molecular weight of 5700. Condensation of I in the form of the dibasic acid with ethylene glycol in the absence of added catalyst gave an insoluble, infusible, rubbery gel. This crosslinking effect in the presence of certain catalysts was also observed in polyesters prepared from dimethyl terephthalate and ethylene glycol containing 10-30% of the ester-acetal I.

A SEARCH FOR NEW FIBER CROPS. II. ANALYTICAL EVALUATIONS, CONTINUED.
H. J. Nieschlag, F. R. Earle, G. H. Nelson, and R. E. Perdue, Jr.[1]
[1](USDA Crops Research Division, Beltsville, Md.)
TAPPI 43(12): 993-998. December 1960.

In the continued search for plants that may have potential as sources of pulp for papermaking, data on 122 more species in 22 plant families are reported. Plants are evaluated by a comparative rating system based on these laboratory data. Samples having the most favorable characteristics were in the grass, legume, milkweed, and spurge families.

CONTRACT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U. S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division of the Agricultural Research Service.]

COPOLYMERS OF VINYL CHLORIDE AND SOME VINYL ESTERS OF ACIDS DERIVED FROM PINENE.
C. S. Marvel,[1] Yokio Shimura,[1] and F. C. Magne.[2] [1](University of Illinois, Urbana), [2](Southern Utilization Research and Development Division, New Orleans).
J. Polymer Sci. 45(145): 13-24. July 1960.

POLYMYRCENE.
C. S. Marvel and Charles C. L. Hwa. University of Illinois, Urbana.
J. Polymer Sci. 45(145): 25-34. July 1960.

MILLING PROPERTIES OF WHEAT IN RELATION TO PEARLING, SCOURING, AND IMPACTION.
G. M. Grosh, J. A. Shellenberger, and E. P. Farrell.
Kansas State University, Manhattan.
Cereal Chem. 37(5): 593-602. September 1960.

RELATIONSHIP OF TRACE METALS TO THE ALCOHOL-EFFECT IN CITRIC ACID SYNTHESIS BY *ASPERGILLUS FONSECAEUS*.
Alex Ciegler and Kenneth B. Raper. University of Wisconsin, Madison.
Arch. für Mikrobiol. 37(2): 188-192. October 21, 1960.

VINYL OCTADECYL ETHER COPOLYMERS.
J. F. Dunphy and C. S. Marvel. University of Illinois, Urbana.
J. Polymer Sci. 46(148): 542-543. October 1960.

CATIONIC COPOLYMERIZATION OF SOME ALPHA-METHYLSTYRENES WITH VINYL 2-CHLOROETHYL ETHER. SOLVENT EFFECTS.
C. S. Marvel and James F. Dunphy. University of Illinois, Urbana.
J. Org. Chem. 25(12): 2209-2211. December 1960.

[Report of research work supported with funds provided by the U. S. Department of Agriculture under the authority of U. S. Public Law 480, 83rd Congress, and sponsored by the Northern Utilization Research and Development Division.]

OPTICALLY ACTIVE POLYAMIDES AND POLYMETHACRYLATES CONTAINING SUGAR RESIDUES.
T. P. Bird, W. A. P. Black, E. T. Dewar, and D. Rutherford.
Arthur D. Little Research Institute, Inveresk, Musselburg, Midlothian, England.
Chem. & Ind. (43): 1331-1332. October 22, 1960.

A CONTRIBUTION TO THE STUDY OF RANDOM DEGRADATION OF CHAIN POLYMERS.
D. Mejzler, J. Schmorak, and M. Lewin.
Institute for Fibres and Forest Products Research, Ministry of Commerce and Industry, Jerusalem, Israel.
J. Polymer Sci. 46(148): 289-302. October 1960.

**ADD TO ARS-71-3, SUPPLEMENT 12

CONTRACT RESEARCH PUBLICATIONS

POLYMERIZATION REACTIONS OF THE ACRYLATE AND METHACRYLATE ESTERS OF ALCOHOLS FROM JOJOBA OIL.
C. S. Marvel,[1] David M. Paisley,[1] Ghazi M. A. Khattab,[1] W. G. Bickford,[2] and Sara P. Fore.[2] [1](University of Illinois, Urbana), [2](Southern Utilization Research and Development Division, New Orleans).
J. Polymer Sci. 44(144): 289-294. June 1960.

** Notice of publication omitted from this issue.

PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased from the U. S. Patent Office, Washington, D. C.]

PROTECTIVE COATING COMPOSITIONS FROM ALIPHATIC CONDENSED POLYUNSATURATED FATTY ALCOHOLS AND THEIR ESTERS.

Lyle E. Gast, John C. Cowan, Howard M. Teeter.
U. S. Patent 2,952,556. September 13, 1960.

This invention relates to a process for the preparation of the above compositions which comprises condensing an aliphatic polyunsaturated alcohol selected from the group consisting of oleyl, linoleyl, linolenyl alcohol, and mixture thereof, in the presence of an alkaline catalyst and a boron compound to form condensed aliphatic polyunsaturated alcohols, reacting the condensed aliphatic polyunsaturated alcohols thus formed with an organic acid in the presence of an acid catalyst to form a condensed aliphatic polyunsaturated alcohol ester, dissolving a member selected from a group consisting of the said condensed aliphatic polyunsaturated alcohol and the said mono and said dicarboxylic acid esters of the said condensed aliphatic polyunsaturated alcohols, and mixtures thereof, in a solvent containing a cobalt napthenate drier.

PRODUCTION OF EXTRACELLULAR INVERTASE BY CERTAIN STRAINS OF YEASTS.

Robert G. Dworschack and Lynferd J. Wickerham.
U. S. Patent 2,953,500. September 20, 1960.

This invention relates to the production of extracellular invertase, an enzyme formerly believed to be found only within the yeast cell. The process consists of inoculating a carbohydrate medium containing an assimilable source of nitrogen with yeast capable of secreting invertase and providing either aerobic or anaerobic culture conditions while cultivating the yeast in a submerged state as usually practiced by the art. The cells are removed by centrifugation and the clear liquid is evaporated under vacuum to a syrup and may be dried further to obtain solids having high invertase activity. Optimum yields are obtained in 4 to 7 days. The resultant enzyme products contain less contaminating enzymes, proteins, and other yeast degradation materials than preparations made by the usual process of autolyzing yeasts.

PROCESS OF SEPARATION OF YEASTS FROM LIQUID MEDIA BY AGGLUTINATION OF CELLS OF OPPOSITE MATING TYPES.

Lynferd J. Wickerham.
U. S. Patent 2,960,445. November 15, 1960.

The invention concerns the flocculation resulting from sexual phenomenon in which yeast cells of opposite sexes strongly clump together. The mechanism is useful for the separation of yeasts and classification of fermented liquids.

FREE FLOWING, HYDROPHOBIC GRANULAR STARCH AND METHOD OF MAKING THE SAME.

Ivan A. Wolff.
U. S. Patent 2,961,339. November 22, 1960.

Granular starch is treated with an aqueous solution of an alkyl siliconate (methyl siliconate) and then dried. The dried starch is washed with water and dried again. This sequence of steps produces a water repellent starch having no residual alkalinity.

METHOD OF PRODUCING PHOSPHOMANNAN BY SACCHARIDE FERMENTATION.

Robert G. Benedict, Allene R. Jeanes, Lynferd J. Wickerham, and Seymour Peter Rogovin.
U. S. Patent 2,961,378. November 22, 1960.

A method has been discovered for producing by whole culture fermentation under industrially feasible conditions a type of polysaccharide never available heretofore. The polysaccharide is synthesized by a newly discovered species of yeast, *Hansenula holstii*, when grown on a medium containing corn sugar (glucose), inorganic phosphate, trace elements, and organic nitrogen sources. The polysaccharide is composed of anhydromannose sugar units, 20 percent of which carry a monopotassium phosphate unit. This combination of polymerized sugar units and the mineral acid, phosphoric acid, impart unique properties to the product which provide the basis for unique practical applications.

PROCESS AND APPARATUS FOR REMOVING RAT EXCRETA PELLETS AND OTHER FOREIGN MATERIALS FROM WHOLE CORN KERNELS.

Jesse R. Dilley and Frank C. Wohlrabe.
U. S. Patent 2,962,230. November 29, 1960.

The process consists of scalping and magnetic separation of a mixture of shelled corn, insect infested corn and rat pellets prior to passage of the material in a single layer on a grooved rubber belt between a grooved rubber roll and another roll or between a pair of grooved rubber rolls. The pressure of the rolls deforms and fragments the pellets and the infested corn kernels, but not the sound kernels. Separation is made by subsequent screening and aspiration equipment. The passage of the material through the rapidly rotating rolls causes the material to be hurled at a high speed against a rubber impact plate resulting in additional fragmentation of the pellets, and the infested corn kernels, while leaving the good corn intact. A current of air is used to blow the debris away from the good corn during the operation.

PREPARATION OF DECANOIC ACID FROM *CUPHEA LLAVEA* SEED.

Thomas K. Miwa, Cecil R. Smith, Jr., and Timothy L. Wilson.
U. S. Patent 2,964,546. December 13, 1960.

Decanoic acid is obtained in high yields by steam distilling the mixed acids obtained by saponifying and neutralizing the solvent-extracted glyceride oil of *Cuphea llavea*.

Similar lists of publication abstracts and patents are available from the other three Regional Utilization Research and Development Divisions of the Agricultural Research Service, U. S. Department of Agriculture. The addresses and fields of research covered are:

Division	Principal Fields of Research
Eastern Utilization Research and Development Division 600 East Mermaid Lane Philadelphia 18, Pennsylvania	Animal products: dairy, meat, fats, and leather; plant products: Eastern fruits and vegetables, tobacco, honey, maple, and new crops; and allergen studies.
Southern Utilization Research and Development Division Post Office Box 19687 New Orleans 19, Louisiana	Cotton and cottonseed; tung fruit; pine gum; Southern fruits and vegetables, including citric, sweetpotatoes, and cucumbers; sugarcane; rice; peanuts; and new crops.
Western Utilization Research and Development Division 800 Buchanan Street Albany 10, California	Western fruits, nuts, vegetables, and rice; poultry products; forage crops; wheat and barley; wool and mohair; sugar beets; dry beans and peas; castor beans; and new crops.